National Aeronautics and Space Administration

NASA Partners with Radiometrics Corporation to Improve Weather Forecasting and Flight Safety

Small Business Innovation Research (SBIR) funding has enabled NASA's Glenn Research Center (GRC) and the Radiometrics Corporation to jointly develop a narrow-beam radiometer capable of providing accurate, real-time information on icing conditions for aircraft. As planes pass through clouds, they can come into contact with supercooled water droplets which freeze onto unprotected surfaces of the aircraft during flight. The resulting ice accretion can dramatically reduce aircraft performance and control and constitutes a significant flight hazard. The radiometer detects and quantifies water particles in clouds to reduce the dangers of ice buildup on aircraft and improve flight safety. In addition, spinoffs of the radiometer have provided continuous upper air thermodynamic and liquid surveillance, which dramatically improves high-impact local weather forecasting.

Benefits of Technology Transfer

- The system can warn pilots of regions of hazardous icing conditions aloft, allowing for timely rerouting or diversion, increasing safety while minimizing flight delays.
- Spinoff radiometers helped meteorologists provide short-term weather predictions during the 2008 and 2010 Olympic Games and they are now being used in air traffic control towers around the world.
- The radiometer also has potential applications in weather research, operational weather forecasting, hydrology, rainfall estimates, soil moisture studies, snow pack research, oceanographic research, satellite sensor calibration, and global climate change research.

success

On the Record

"We rely on the SBIR program as a place to discover revolutionary new ideas and technologies. Radiometrics has been a great partner and because they have taken technologies developed under SBIR and brought them to market very quickly, this collaboration has greatly benefitted the marketplace as well." — *Andrew Reehorst, Aerospace Engineer, NASA's Glenn Research Center*

"Local short-term forecasting has been limited to two static photographs per day, based on weather balloon soundings of the atmosphere. Our radiometers provide a continuous video, so it's a powerful new tool for more timely and accurate surveillance of high-impact, local weather." — *Randolph "Stick" Ware, Chief Scientist and Founder, Radiometrics Corporation*

About Radiometrics Corporation

Radiometrics Corporation, based in Boulder, Colorado, is a world leader in microwave radiometer product innovation and sales. Their rugged, compact thermodynamic profilers observe three-dimensional air temperature, humidity, and liquid structures that define local weather. More than 200 of their radiometers are now in operation worldwide.

Technology Origins

The NASA Icing Remote Sensing initiative started in 1997 when the White House Commission on Aviation Safety and Security directed the FAA and NASA to significantly increase the level of safety for aircraft, including all-weather operations. NASA's Aviation Safety Investment Strategy Team (ASIST) identified in-flight icing as one of its top three priorities to improve flight safety. GRC has led NASA's efforts in developing remote sensing technologies to detect the location and severity of dangerous icing conditions aloft.

The Transfer Process

In 2004, the Radiometrics Corporation applied for and received an SBIR contract to design and construct a turnkey, fast-sampling, multi-frequency, dual polarization narrow-beam radiometer system. Combining ground-based microwave radiometers with radars has shown great promise in detecting icing hazards, but limitations of the previous generation of radiometers had restricted their value for GRC's need. The Radiometrics team worked with aerospace engineers at GRC to find solutions for several technical challenges. Together they developed a new instrument—the NASA Narrow-beam, Multi-frequency Microwave Radiometer (NNMMR). Extensive testing determined that the NNMMR would be a valuable addition to the NASA Icing Remote Sensing System for detecting in-flight icing hazards. This SBIR contract also enabled Radiometrics Corporation to bring to market a pencil-beam radiometer designed to detect supercooled liquid along flight paths. The company's radiometers are now used to detect icing conditions and to predict dangerous weather conditions, including thunderstorms, strong winds, lightning, hail, icing, fog, tornadoes, and flash floods.

Looking Ahead

GRC plans to continue research and development on the radiometer at Cleveland Hopkins Airport, in Ohio, with the goal of developing its straight-line, vertical profile measurements into a 360-degree bubble capable of extending 20 nautical miles in every direction. The technology transfer process recently came full circle when NASA's Jet Propulsion Laboratory purchased modular radiometers from Radiometrics Corporation for its Deep Space Network, a worldwide antenna network to support exploration of our solar system.

For More Information

If you would like additional information about Glenn's technology transfer opportunities, please contact:

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